SMILEI: A collaborative, open-source, multi-purpose PIC code for the next generation of super-computers MICKAEL GRECH, LULI, CNRS, J DEROUILLAT, MdlS, A BECK, LLR, M CHIARAMELLO, A GRASSI, F NIEL, F PEREZ, T VINCI, LULI, M FLE, IDRIS, N AUNAI, J DARGENT, LPP, I PLOTNIKOV, IRAP, G BOUCHARD, LIDyL, P SAVOINI, LPP, C RICONDA, LULI — Over the last decades, Particle-In-Cell (PIC) codes have been central tools for plasma simulations. Today, new trends in High-Performance Computing (HPC) are emerging, dramatically changing HPC-relevant software design and putting some - if not most - legacy codes far beyond the level of performance expected on the new and future massively-parallel super computers. SMILEI is a new open-source PIC code co-developed by both plasma physicists and HPC specialists, and applied to a wide range of physics-related studies: from laser-plasma interaction to astrophysical plasmas. It benefits from an innovative parallelization strategy that relies on a super-domain-decomposition allowing for enhanced cache-use and efficient dynamic load balancing. Beyond these HPC-related developments, SMILEI also benefits from additional physics modules allowing to deal with binary collisions, field and collisional ionization and radiation back-reaction. This poster presents the SMILEI project, its HPC capabilities and illustrates some of the physics problems tackled with SMILEI.

Mickael Grech
LULI, CNRS

Date submitted: 20 Jul 2016   Electronic form version 1.4